

with an efficient tool, and the cost of building that tool itself. Unless this is done, it is likely that the shop is burdened with a great number of special tools and fixtures which, while they may be very useful for the production of the parts for which they are intended, actually involve a loss. It is readily seen how uneconomical it would be to make an expensive jig and fixture for a machine or a part of a machine that would only have to be duplicated a few times. In some cases, of course, there may be a gain in using special devices in order to get extremely good and accurate results.

Locating Points. — The most important requirements in the design of jigs are that good facilities be provided for locating the work, and that the piece to be machined may be easily inserted and quickly taken" out of the jig, so that no time is wasted in placing the work in position on the machine performing the work. In some cases, a longer time is required for locating and clamping the piece to be worked upon than is required for the actual machine operation itself. In all such cases the machine performing the work is actually idle the greater part of the time, and, added to the loss of the operator's time, is the increased expense for machine cost incurred by such a condition. For this reason, the locating and clamping of the work in place quickly and accurately should be carefully studied by the designer before any attempt is made to design the tool. In choosing the locating surface or points of the piece or part, consideration must be given to the facilities for locating the corresponding part of the machine in a similar manner. It is highly important that this be done, as otherwise, although the jigs may be alike, as far as their guiding appliances are concerned, there may be no facility for locating the corresponding part in the same manner as the one already drilled, and while the holes drilled may coincide, other surfaces, also required to coincide, may be considerably out of line. One of the main principles of location, therefore, is that two component parts of the machine should be located from corresponding points and surfaces.

If possible, special arrangements should be made in the design of the jig so that it is impossible to insert the piece in any but